ORIGINAL ARTICLE

# Evaluation of Surgical Conditions during Elective Endoscopic Sinus Surgery with Total Intravenous Anesthesia and Monitored Anesthesia Care

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*Received on:* 10 June 2020; *Accepted on:* 06 June 2023; *Published on:* xx xx xxxx


## Abstract

**Background:** The diseases of sinuses are commonly seen in all age groups. Currently, endoscopic sinus surgery (ESS) is commonly performed as a daycare procedure. The anesthetic technique should also be selected on this basis. Keeping these considerations in view, ESS has been performed under total intravenous anesthesia (TIVA) using or monitored anesthesia care (MAC).

**Materials and methods:** This prospective randomized open-level study was conducted in 40 ASA I–II adult patients of either sex, undergoing elective ESS. All the patients were divided into two groups according to the randomized table: Group A: TIVA and group B: local anesthesia and conscious sedation. In group B, patients who did not tolerate the procedure were converted to the TIVA group.

**Results:** The duration of surgical procedure was 69.00 ± 9.63 minutes in group A patients and 55.00 ± 10.34 minutes in group B patients. This result was statistically significant. But in group A, 55% of patients had a score of 2, and 45% had a score of 3. In group B, 90% had a score of 2 and 10% had a score of 3. This was statistically significant ($p < 0.05$).

**Conclusion:** The time taken for ESS is reduced, the surgical field is better despite of higher mean blood pressure done with MAC care in comparison to TIVA. However, this needs the cooperative patient.


**Keywords:** Endoscopic sinus surgery, Monitored anesthesia care, Total intravenous anesthesia.

*Clinical Rhinology* (2020): 10.5005/jp-journals-10013-1384

## Introduction

The diseases of sinuses are commonly seen in all age groups. The endoscopic procedures for sinuses are commonly used to treat various diseases. This procedure increases the ability of surgeons to manage both limited and widespread disease through better visualization of the surgical field.[1] The common procedures done with endoscopic sinus surgery (ESS) are infundibulotomy, turbinectomy, rhinoplasty, septoplasty, etc. The chronic sinusitis is commonly treated with this technique through transnasal route.[2] Nowadays, ESS is usually done as a day care surgery.[3] The anesthetic agents should have a short duration of action for early recovery and discharge. The other consideration is a bloodless field during surgery for better visibility in the confined area. The tissue in nasal cavities is inflamed with greater vascularity. This leads to increased bleeding and decreased visibility in the surgical space during ESS.[2] So, the anesthetic technique adopted should provide optimal surgical conditions and patient comfort.[4] Endoscopic sinus surgery can be performed under total intravenous anesthesia (TIVA) or local anesthesia and conscious sedation.[5,6] The advantages of TIVA are analgesia, patient cooperation is not an issue, and decreased risk of aspiration of blood and irrigation fluids. However, the risk of complications like orbital penetration increases as the patient is not awake with TIVA. The experience of a surgeon can detect and prevent such complications. There are limited studies comparing these two techniques of anesthesia for ESS. The choice of anesthesia depends on subjective preference of surgeon and patient. Hence, we compared the surgical condition and hemodynamic changes under TIVA with local anesthesia and conscious sedation during elective ESS.

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**How to cite this article:** Singla SK, Singla A. Evaluation of Surgical Conditions during Elective Endoscopic Sinus Surgery with Total Intravenous Anesthesia and Monitored Anesthesia Care. Clin Rhinol 2020;xx(x):xx–xx.

**Source of support:** Nil

**Conflict of interest:** None

## Materials and Methods

This was a prospective randomized open-level study conducted in 40 American Society of Anesthesiologists (ASA) status-I or -II adult patients of either sex having elective ESS for 2 years after permission from the Institutional Ethics Committee. The exclusion criteria included bleeding disorders, receiving anticoagulants, and a history of allergy to local anesthetics. All patients had preoperative anesthetic checkups in the PAC room. In the operative room, monitoring included electrocardiogram, mean blood pressure, and pulse oximeter ($SpO_2$). All the patients were randomized into two groups with randomized table.

**Table 1:** Demographic data

| *Parameter* | *Group A* | *Group B* | *p-value* |
|---|---|---|---|
| Age (years) (mean ± SD) | 39.38 ± 12.16 | 37.54 ± 9.58 | 0.666 |
| Weight (kg) (mean ± SD) | 59.30 ± 11.22 | 60.10 ± 9.26 | 0.892 |
| Sex (M/F) | 12/8 | 14/6 | 0.125 |
| ASA (I/II) | 14/6 | 13/7 | 1.000 |

Group A: Included 20 patients who had total intravenous anesthesia (TIVA) with propofol, fentanyl, vecuronium, and maintenance with continuous propofol infusion. About 50% oxygen in air was used with intermittent positive-pressure ventilation. The infusion rate of propofol was titrated to hemodynamic parameters. However, maximum 8 mg/kg/hour of propofol was given. Neuromuscular blockade was reversed with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg.

Group B: Included 20 patients who had monitored anesthesia care (MAC). The area was infiltrated with 2% lignocaine with 1:2,00,000, maximum dose used was 7 mg/kg. Fentanyl 1–2 µg/kg and midazolam 0.02–0.04 mg/kg intravenously were given for conscious sedation. The patients in which this technique failed were given TIVA as in group A. In both the groups, heart rate, $SpO_2$, and mean blood pressure were monitored at an interval of 5 minutes intraoperatively and hourly, thereafter in the postop period, along with any complications or side effects.

The surgical field was assessed by the surgeon as per Fromme et al.[7]

- No bleeding (cadaveric condition).
- Slight bleeding, no suction needed.
- Slight bleeding, occasional suction needed.
- Moderate bleeding, frequent suction needed.
- Moderate bleeding, frequent suction needed; surgical field visibility decreased after removal of suction.
- Severe bleeding, constant suction needed; blood seen faster than removal with suction, surgical field visibility severely jeopardized.

Best score was considered as 2 or 3.

### Statistical Analysis

Data were expressed as mean ± SD. Student's *t*-test and Chi-square test were used for comparison of demographic data. Chi-square test was used for the comparison of the surgical field, and the Student's *t*-test for comparison of hemodynamic changes. $p < 0.05$ is significant.

## Results

Demographic data are as per Table 1. Surgical field, heart rate, and mean arterial pressure are shown in Tables 2 to 4 respectively.

### Hemodynamic Parameters

The intraoperative hemodynamic changes including heart rate and mean blood pressure were as follows:

Group A (TIVA) included 12 male and 8 female patients, with mean age 39.38 ± 12.16 years and mean weight 59.30 ± 11.22 kg. About 14 patients were ASA-I and 6 patients of ASA-II status. ASA II had hypertension.

**Table 2:** Comparison between two groups

| | *Group A (mean ± SD)* | *Group B (mean ± SD)* | *p-value* |
|---|---|---|---|
| Duration of surgery (min) | 69.00 ± 9.63 | 55.00 ± 10.34 | 0.000* |
| Surgical field grading | ($n = 20$) | ($n = 20$) | |
| 2 | 11 (55%) | 18 (90%) | 0.035* |
| 3 | 9 (50%) | 2 (10%) | |

*$p < 0.05$, statistically significant

**Table 3:** Comparison of heart rate between two groups

| *Time (min)* | *Group A (mean ± SD)* | *Group B (mean ± SD)* | *p-value* |
|---|---|---|---|
| 0 | 82.56 ± 8.34 ($n = 20$) | 76.23 ± 8.52 ($n = 20$) | 0.062 |
| 10 | 85.20 ± 10.40 ($n = 20$) | 76.32 ± 8.86 ($n = 20$) | 0.010* |
| 20 | 78.23 ± 7.46 ($n = 20$) | 77.22 ± 7.32 ($n = 20$) | 0.742 |
| 30 | 76.67 ± 6.58 ($n = 20$) | 77.52 ± 7.32 ($n = 20$) | 0.264 |
| 40 | 78.60 ± 7.28 ($n = 20$) | 81.11 ± 7.19 ($n = 20$) | 0.393 |
| 50 | 76.82 ± 5.76 ($n = 20$) | 78.00 ± 7.42 ($n = 12$) | 0.686 |
| 60 | 81.84 ± 6.97 ($n = 17$) | 79.67 ± 8.08 ($n = 6$) | 0.277 |
| 70 | 85.66 ± 6.80 ($n = 12$) | 86.20 ± 1.10 ($n = 2$) | 0.286 |
| 75 | 82.20 ± 9.50 ($n = 2$) | 86.00 ± 0.00 ($n = 1$) | 0.745 |

*$p < 0.05$, statistically significant

**Table 4:** Comparison of mean blood pressure between two groups

| *Time (min)* | *Group A (mean ± SD)* | *Group B (mean ± SD)* | *p-value* |
|---|---|---|---|
| 0 | 94.50 ± 7.34 ($n = 20$) | 90.22 ± 6.21 ($n = 20$) | 0.080 |
| 10 | 96.70 ± 10.54 ($n = 20$) | 89.40 ± 6.68 ($n = 20$) | 0.047* |
| 20 | 82.22 ± 9.52 ($n = 20$) | 88.16 ± 5.64 ($n = 20$) | 0.029* |
| 30 | 80.65 ± 7.76 ($n = 20$) | 90.12 ± 7.62 ($n = 20$) | 0.003* |
| 40 | 82.20 ± 7.30 ($n = 20$) | 92.24 ± 7.14 ($n = 20$) | 0.002* |
| 50 | 83.46 ± 7.64 ($n = 20$) | 94.28 ± 8.62 ($n = 12$) | 0.003* |
| 60 | 89.34 ± 8.14 ($n = 17$) | 97.14 ± 6.44 ($n = 6$) | 0.205 |
| 70 | 97.34 ± 7.42 ($n = 12$) | 94.00 ± 0.00 ($n = 2$) | 0.697 |
| 75 | 97.00 ± 8.00 ($n = 2$) | 90.00 ± 0.00 ($n = 1$) | 0.582 |

*$p < 0.05$, statistically significant

Group B (MAC) included 14 male and 6 female patients with mean age 37.54 ± 9.58 years and mean weight 60.10 ± 9.26. Thirteen ASA-I and seven ASA-II status. ASA-II had hypertension. No patient had oversedation. One patient was rescued with TIVA in this group, and another patient was included for statistical analysis.

The duration of surgery was 69.00 ± 9.63 minutes in group A and 55.00 ± 10.34 minutes in group B and was statistically significant. The surgical field score in both groups was 2 or 3.

Group A: 55% had a score of 2 and 45% a score of 3. Group B: 90% had a score of 2 and 10% a score of 3 ($p < 0.05$).

### Hemodynamics

Heart rate was more in group A at 5 and 10 minutes. This can be as a result of intubation. Mean BP was higher in group A at 10 minutes, and after 20 minutes of the surgery, this was higher in group B till 55 minutes with ($p < 0.05$). This difference could be a result of the

maintenance of the depth of anesthesia in TIVA as compared with group B. Despite of high mean BP in group B, the surgical condition was better ($p = 0.035$).

## Discussion

Endoscopic sinus surgery is a common procedure for management of sinus disease and results in better visualization of nasal structures.[8,9] Endoscopic sinus surgery is commonly done for sphenoethmoidectomy, sinusitis, polyposis, repair of cerebrospinal fluid leaks, and orbital decompression.[10–13] Excessive bleeding from inflamed tissue with increased vascularity increases the procedure time and complications like orbital penetration, dural puncture, injury to blood vessels, and injury to medial rectus muscle.[14–18] To overcome this, a number of agents, including beta-blockers, inhalational agents, nitroglycerine, nitroprusside, etc., have been used to provide hypotensive anesthesia with varying results and side effects.[19–22] The side effects of hypotensive agents include tachyphylaxis and cyanide intoxication after administration of sodium nitroprusside, bradycardia with beta-blockers, and delayed recovery with inhalational agents. Reverse trendelenburg position is tried to decrease venous engorgement.

General anesthesia is preferred in noncooperative, anxious patients and advanced disease.[18] The surgical condition was assessed by the same surgeon to reduce the subjective error.

Both groups were comparable in their demographic data. The surgery lasted longer in group A due to the time taken for preparation before general anesthesia, bleeding, and prolonged recovery after anesthesia. In both the groups, surgical field score was within ideal limits. But, in group B, 90% patients had a score of 2 as compared with 55% in group A. This difference in surgical score may be as a result of vasodilatation induced by TIVA.

Despite higher mean BP in group B, surgical condition was better in group B as a result of local use of vasoconstrictors. After completion of surgery, the nasal cavity is packed, making the patient to breathe through his mouth. Extubation should be done in a fully awake patient to prevent aspiration of blood or secretions. The ESS was done using local anesthesia and conscious sedation had less operative time, less blood loss, low surgical cost, and no endotracheal intubation.[23–26] The patient is conscious throughout the surgery and can complain of pain if any adjacent orbital structure is approached by the surgeon to prevent any complications.

## Conclusion

The time taken for ESS is reduced, the surgical field is better despite of higher mean blood pressure done with MAC care in comparison to TIVA. However, this needs the cooperative patient.

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